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Chen et al.

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(54) **APPLYING SECURITY POLICY TO AN APPLICATION SESSION**

(71) Applicant: **A10 Networks, Inc.**, San Jose, CA (US)

(72) Inventors: **Lee Chen**, Saratoga, CA (US); **Dennis Oshiba**, Fremont, CA (US); **John Chiong**, San Jose, CA (US)

(73) Assignee: **A10 Networks, Inc.**, San Jose, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 2 days.

This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

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(52) **U.S. Cl.**
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(58) **Field of Classification Search**
CPC ... H04L 63/20; H04L 63/0227; H04L 67/306; H04L 67/10; H04L 63/02; H04L 65/1026; H04L 63/0407; H04L 51/04; H04M 1/72547; G06F 21/00

See application file for complete search history.

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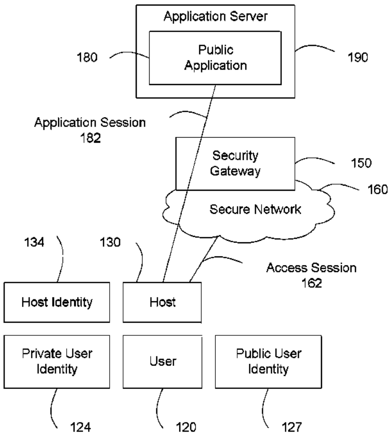
Primary Examiner — Carl Colin
Assistant Examiner — Gary Lavelle
(74) *Attorney, Agent, or Firm* — Carr & Ferrell LLP

(57) **ABSTRACT**

Applying a security policy to an application session, includes: recognizing the application session between a network and an application via a security gateway; determining by the security gateway a user identity of the application session using information about the application session; obtaining by the security gateway the security policy comprising network parameters mapped to the user identity; and applying the security policy to the application session by the security gateway. The user identity may be a network user identity or an application user identity recognized from packets of the application session. The security policy may comprise a network traffic policy mapped and/or a document access policy mapped to the user identity, where the network traffic policy is applied to the application session. The security gateway may further generate a security report concerning the application of the security policy to the application session.

27 Claims, 11 Drawing Sheets



Related U.S. Application Data

continuation of application No. 12/788,339, filed on May 27, 2010, now Pat. No. 8,312,507, which is a continuation-in-part of application No. 12/771,491, filed on Apr. 30, 2010, now Pat. No. 7,979,585, which is a continuation of application No. 11/582,613, filed on Oct. 17, 2006, now Pat. No. 7,716,378.

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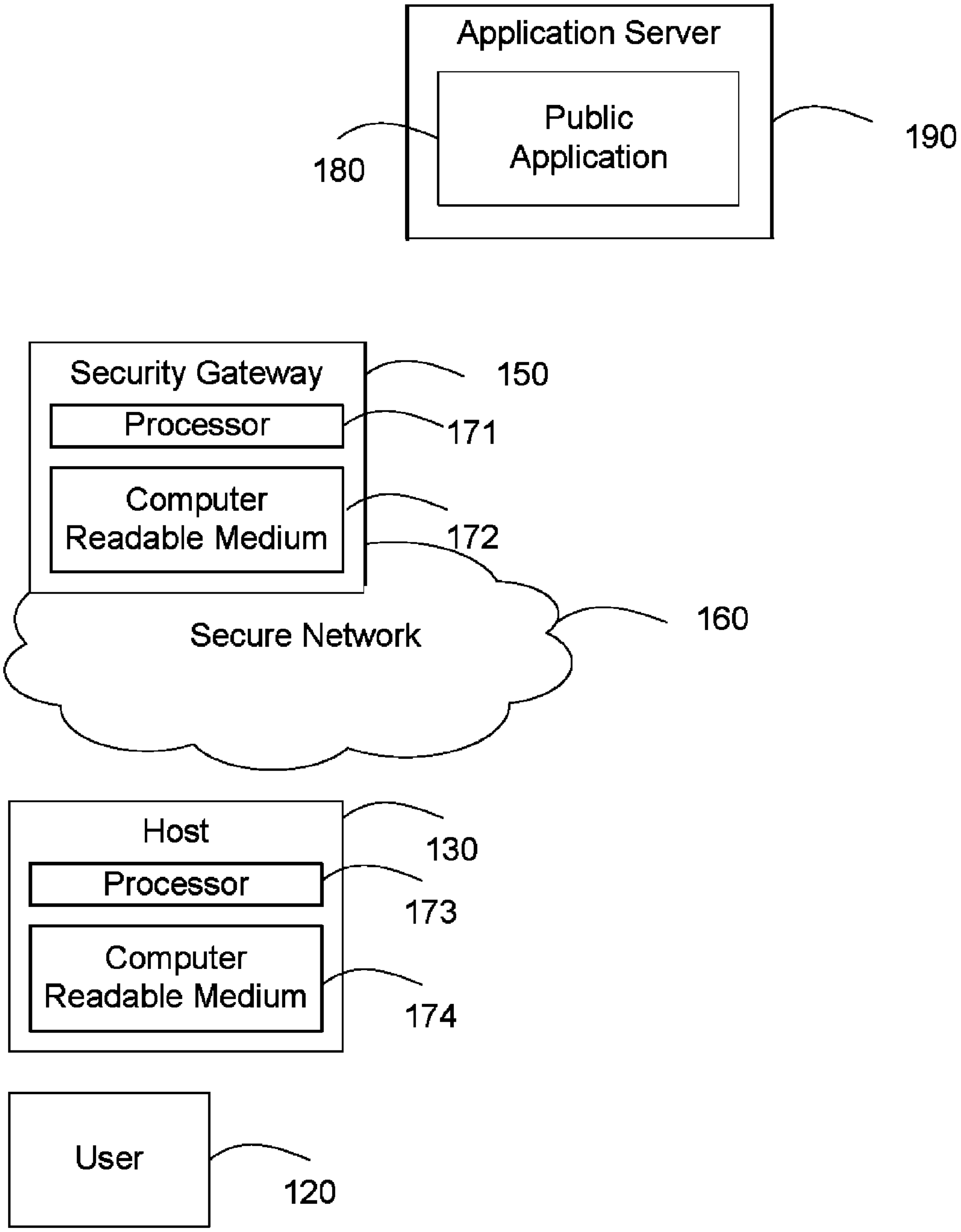
Application Server
Public Application
180
190
Security Gateway
Processor
Computer Readable Medium
150
171
172
Secure Network
160
Host
Processor
Computer Readable Medium
130
173
174
User
120

FIG. 1a

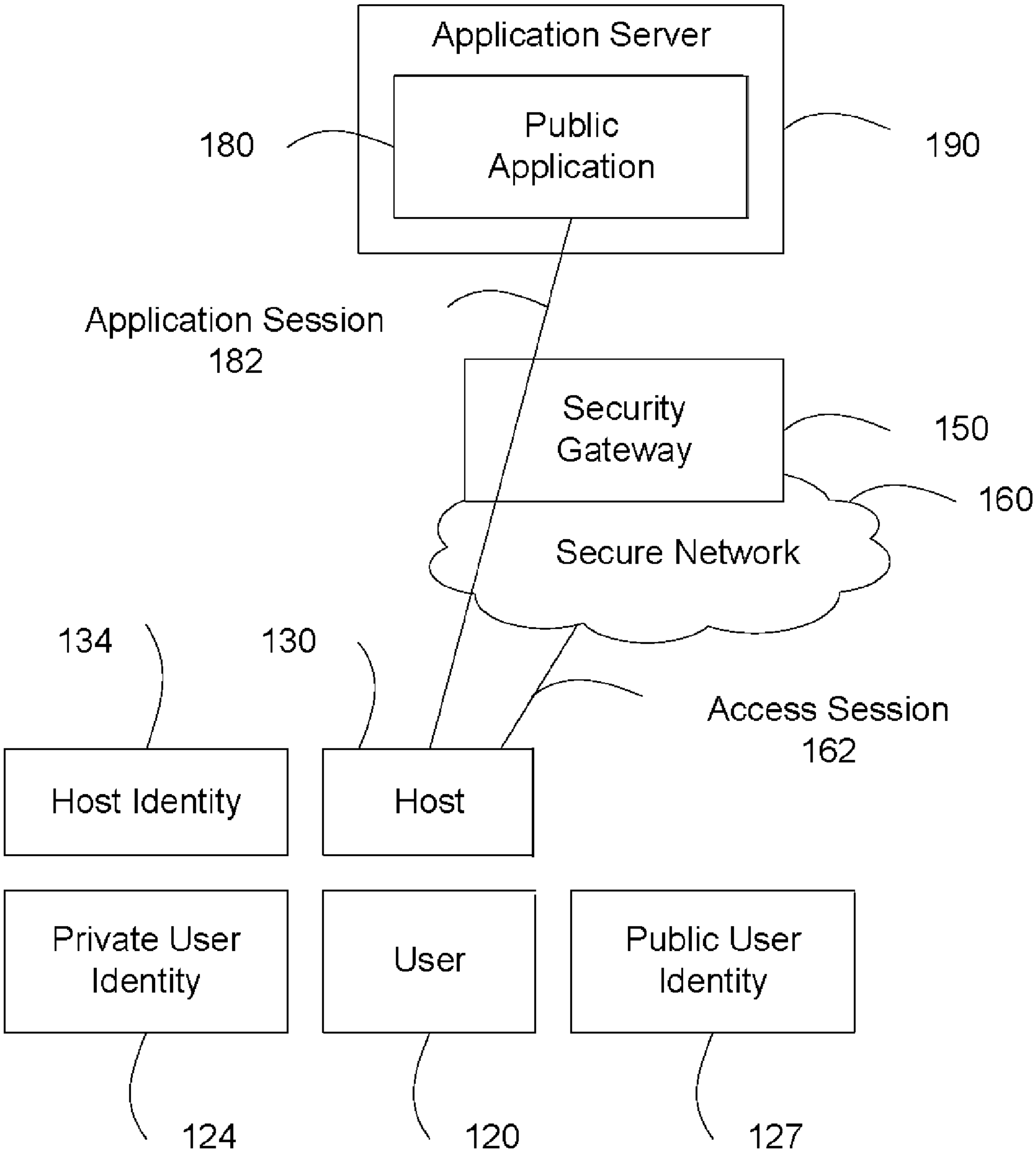
Application Server
Public Application
180
190
Application Session 182
Security Gateway
150
160
Secure Network
134
130
Access Session 162
Host Identity
Host
Private User Identity
User
Public User Identity
124
120
127

FIG. 1b

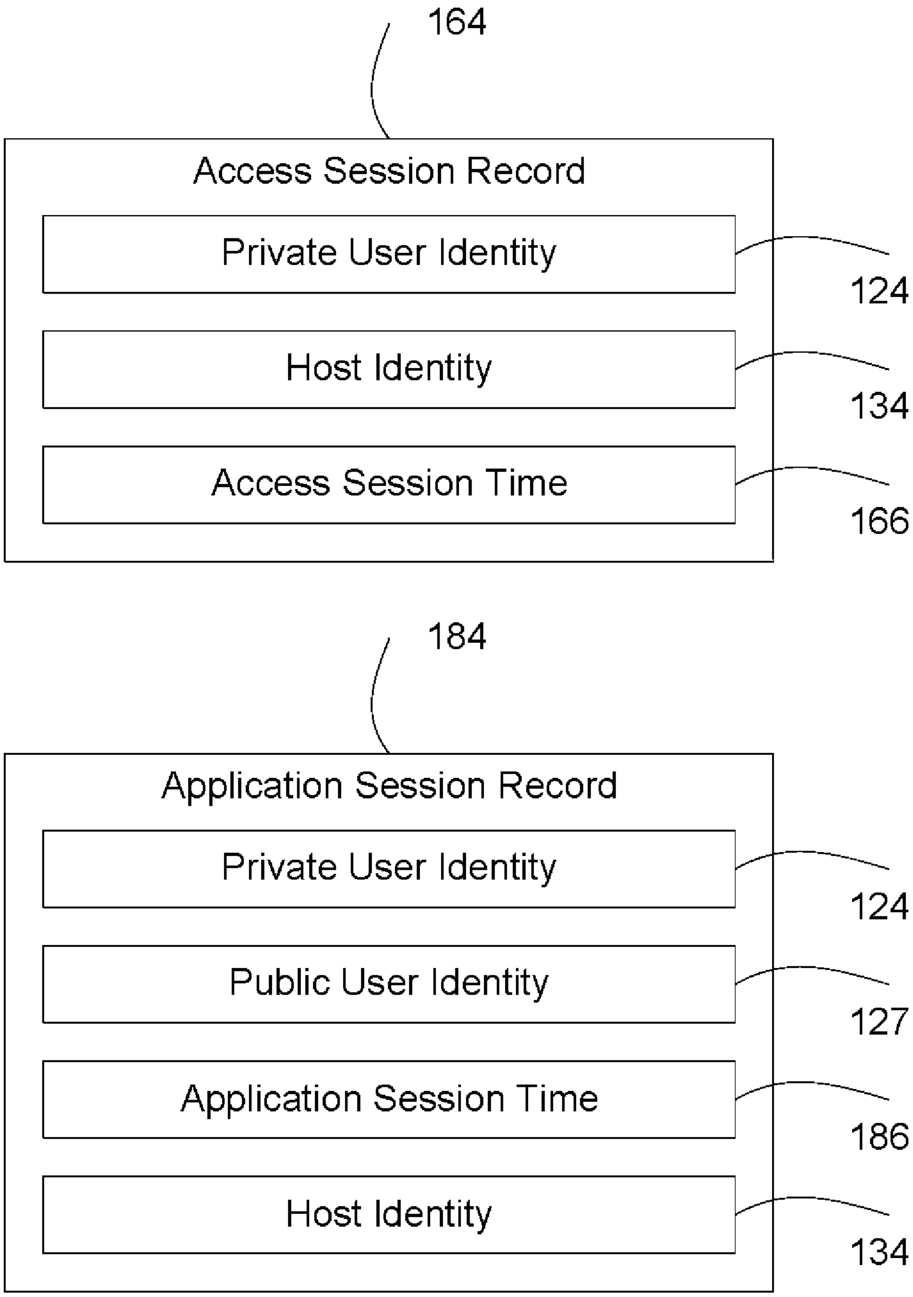
164
Access Session Record
Private User Identity
124
Host Identity
134
Access Session Time
166
184
Application Session Record
Private User Identity
124
Public User Identity
127
Application Session Time
186
Host Identity
134

FIG. 1c

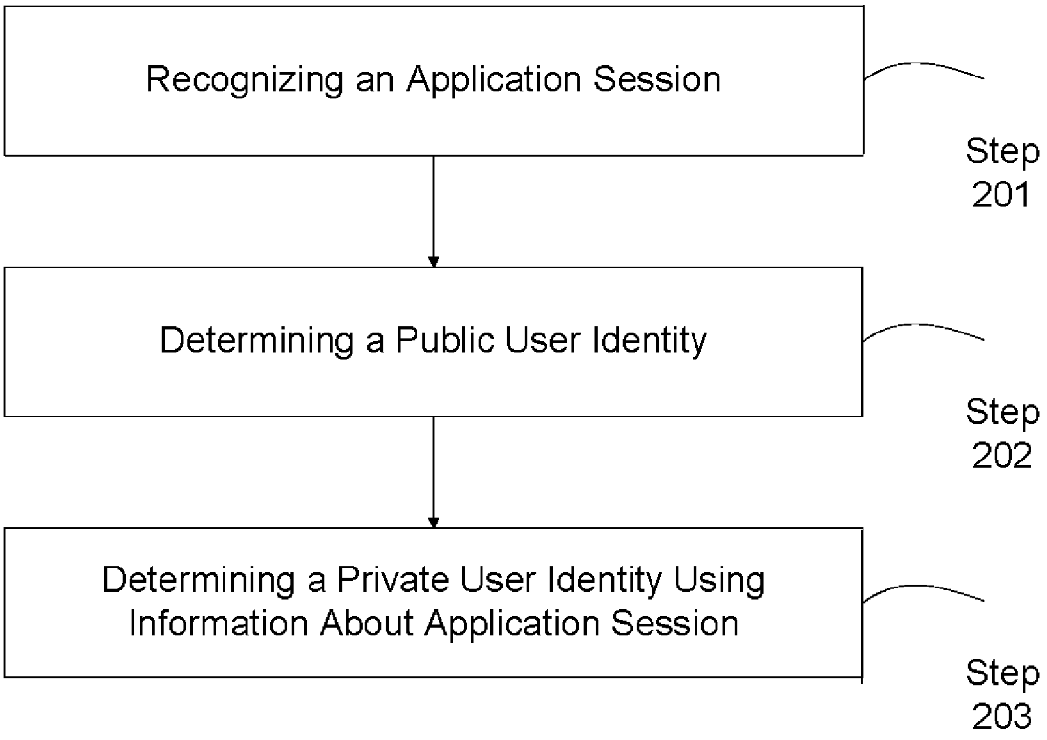
Recognizing an Application Session
Step 201
Determining a Public User Identity
Step 202
Determining a Private User Identity Using Information About Application Session
Step 203

FIG. 2

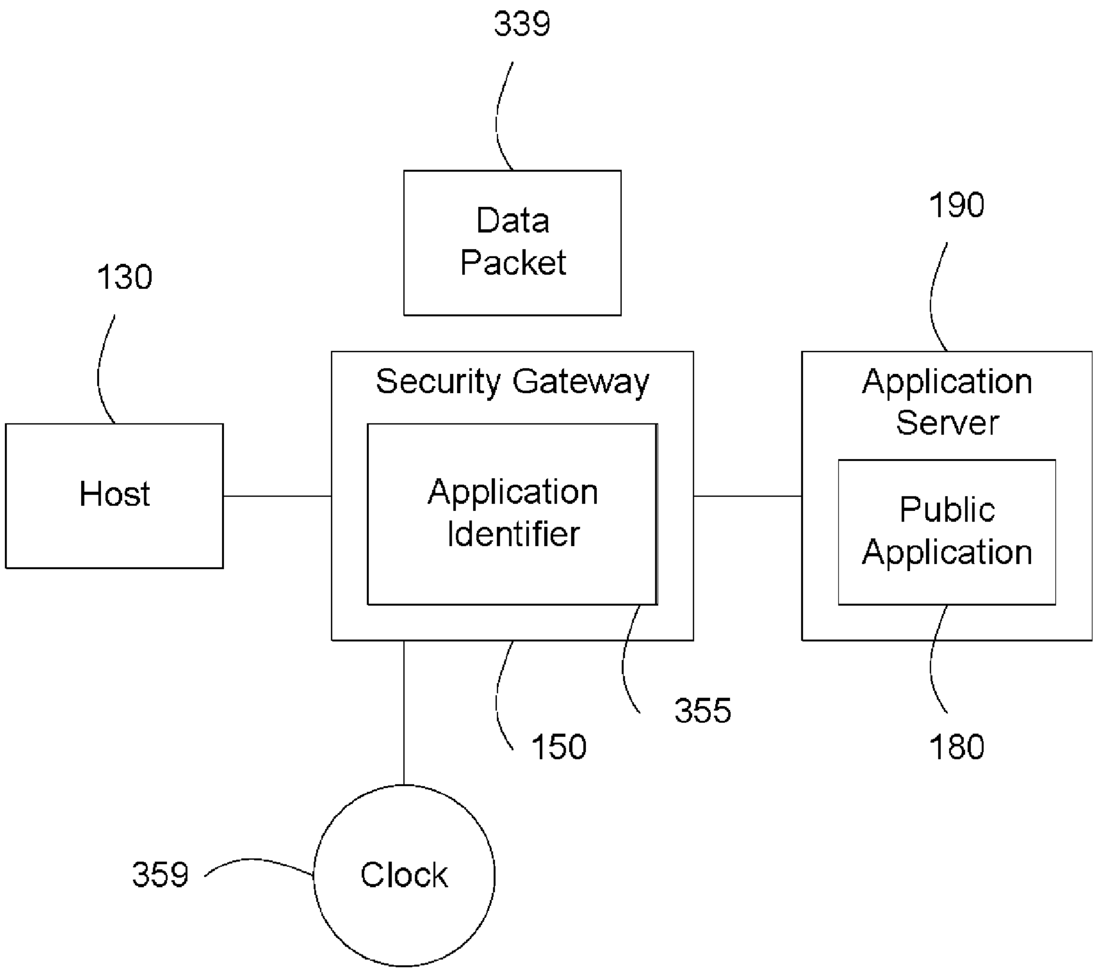
339
Data Packet
190
130
Security Gateway
Application Server
Host
Application Identifier
Public Application
355
150
180
359
Clock

FIG. 3

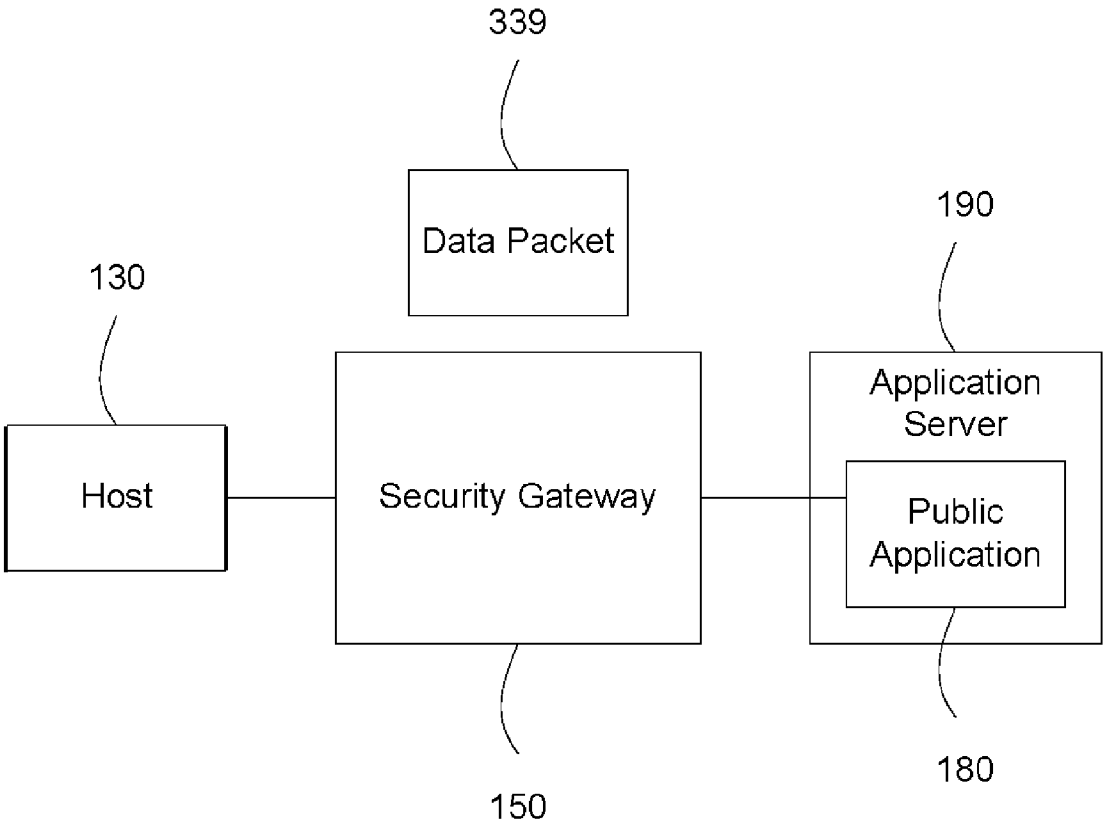
339
Data Packet
190
130
Application Server
Host
Security Gateway
Public Application
150
180

FIG. 4a

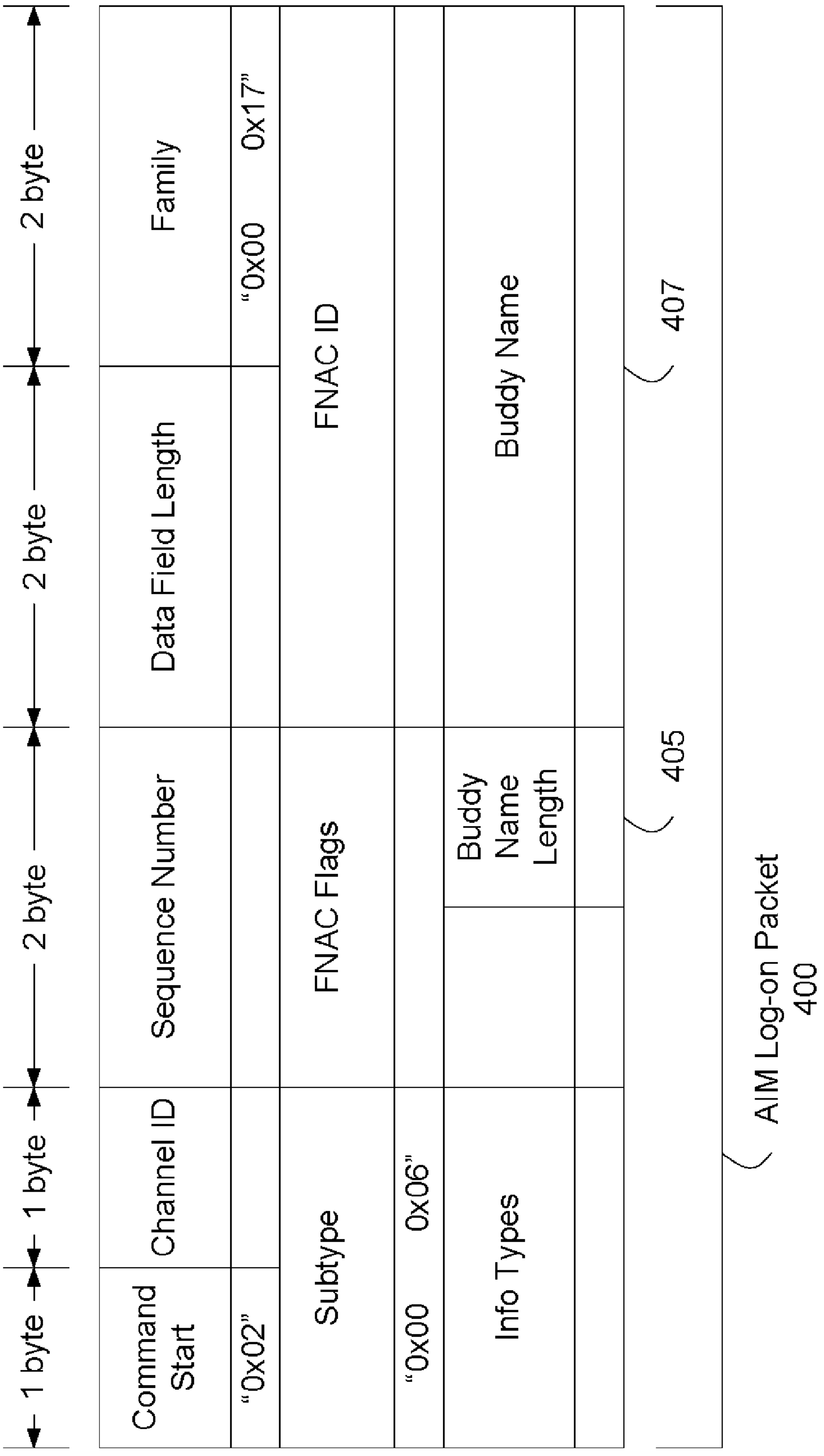
1 byte
1 byte
2 byte
2 byte
2 byte
Command Start
Channel ID
Sequence Number
Data Field Length
Family
"0x02"
"0x00 0x17"
Subtype
FNAC Flags
FNAC ID
"0x00 0x06"
Info Types
Buddy Name Length
Buddy Name
405
407
AIM Log-on Packet 400

FIG. 4b

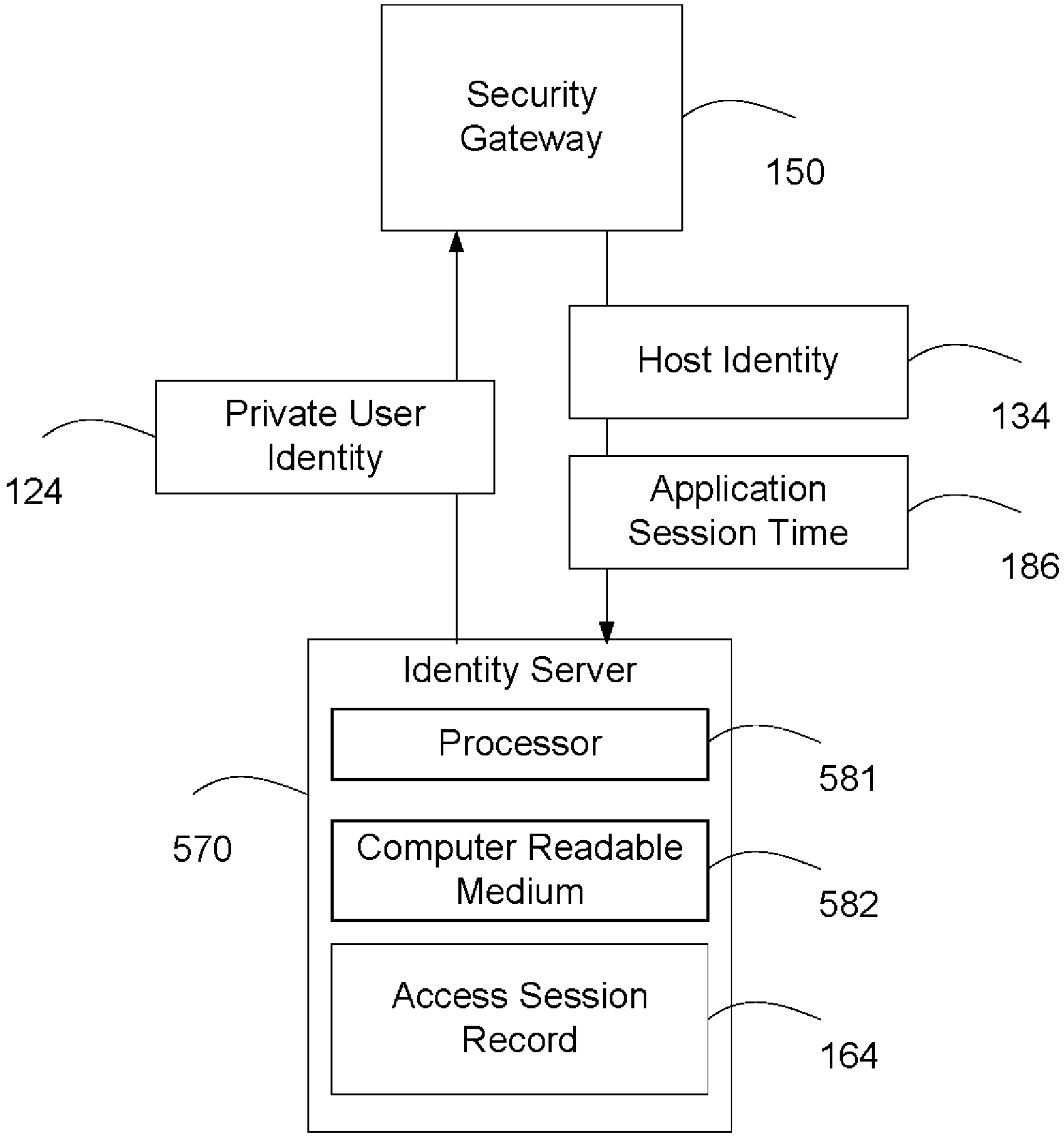
Security Gateway
150
Host Identity
134
Private User Identity
124
Application Session Time
186
Identity Server
Processor
581
570
Computer Readable Medium
582
Access Session Record
164

FIG. 5

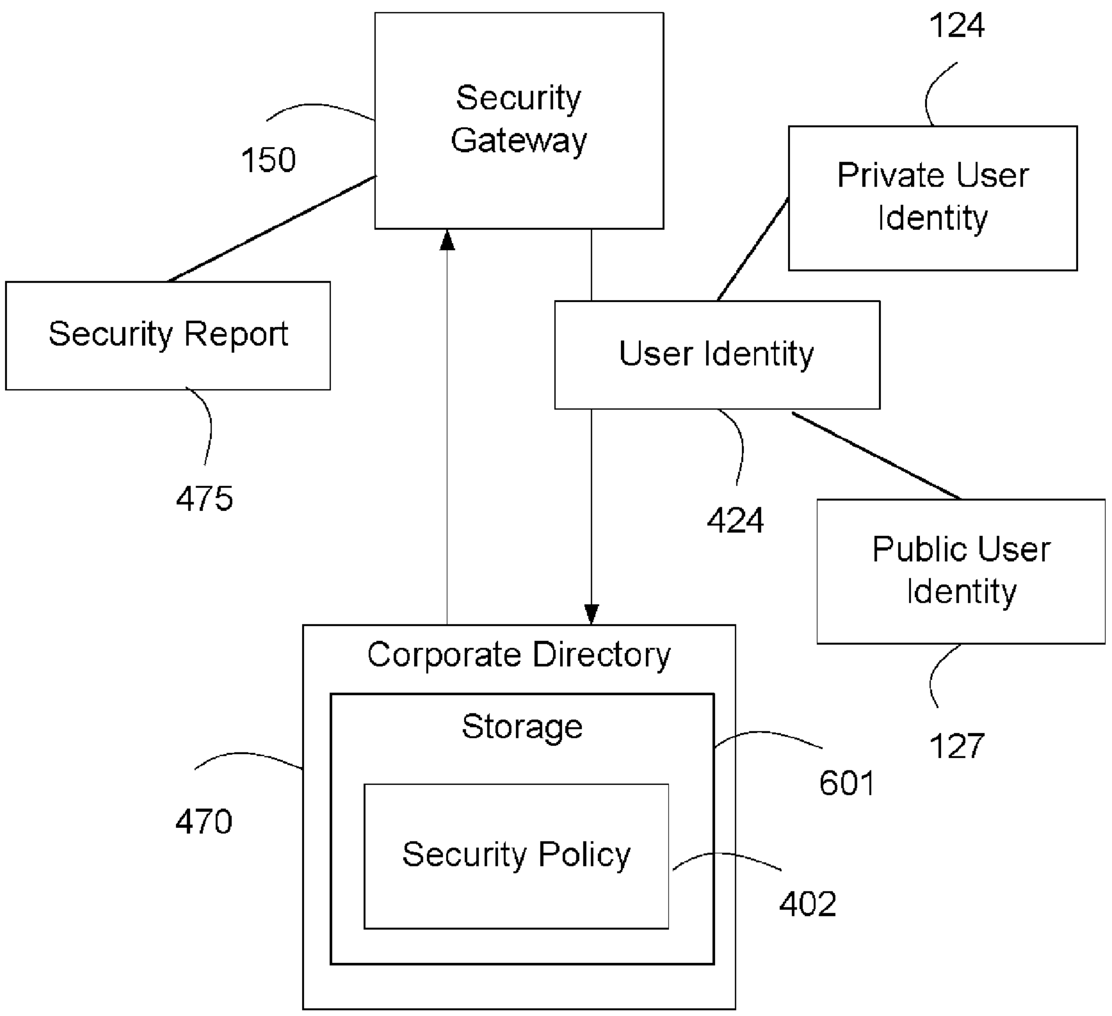
Security Gateway
150
124
Private User Identity
Security Report
User Identity
475
424
Public User Identity
Corporate Directory
Storage
127
601
470
Security Policy
402

FIG. 6

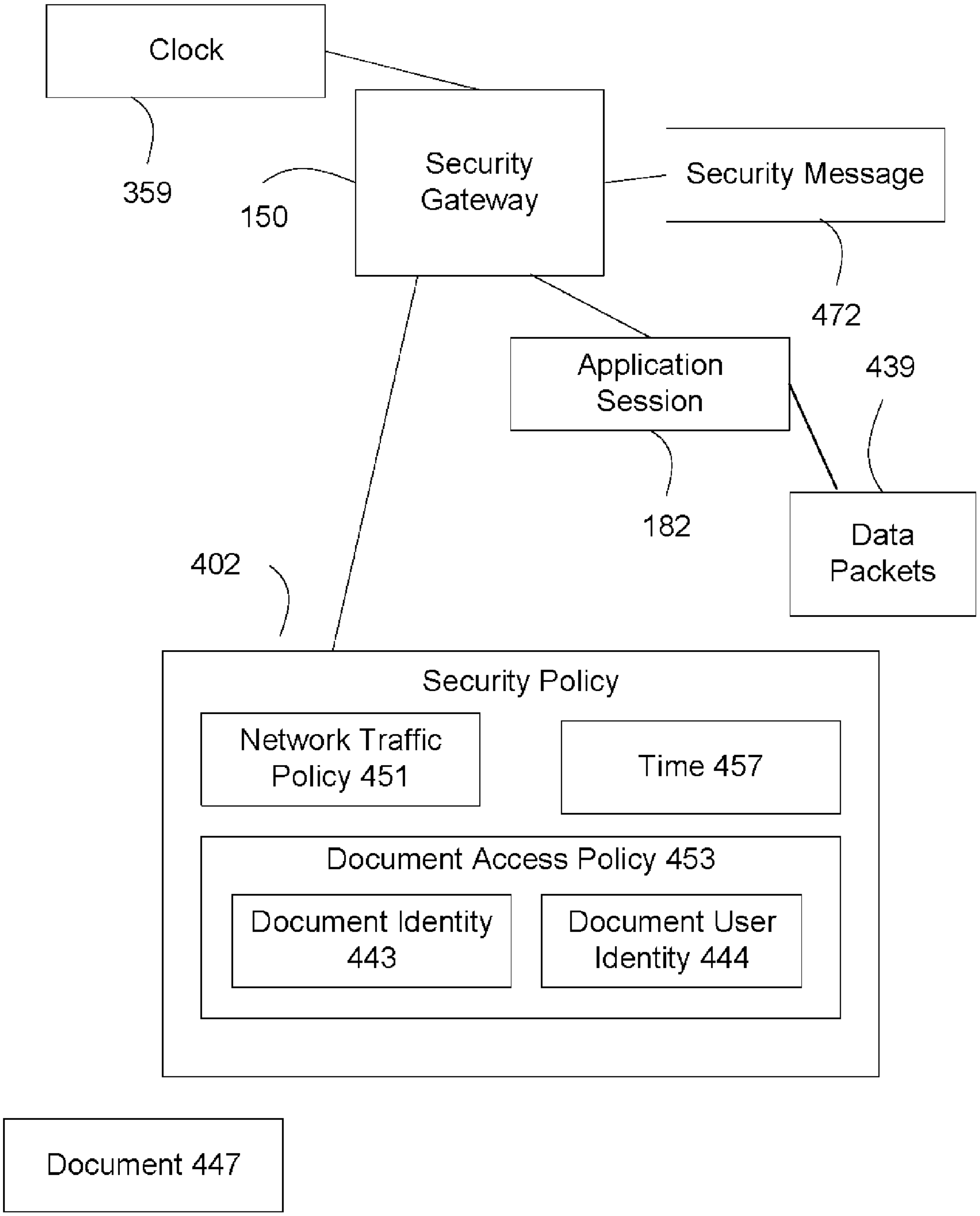
Clock
359
150
Security Gateway
Security Message
472
Application Session
439
182
Data Packets
402
Security Policy
Network Traffic Policy 451
Time 457
Document Access Policy 453
Document Identity 443
Document User Identity 444
Document 447

FIG. 7

Network Traffic Policy 451

Network based Application Session Access Control
Session Connection Rate Control
Traffic Shaping Control
Bandwidth Rate Capacity
Quality of Service or DSCP Marking Control
Packet Forwarding Control
Link Interface Preference
Server Load Balancing Preference
Application Session Modification Control

FIG. 8

APPLYING SECURITY POLICY TO AN APPLICATION SESSION

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation and claims the priority benefit of U.S. patent application Ser. No. 14/061,720, filed on Oct. 23, 2013, issued on Aug. 19, 2014, as U.S. Pat. No. 8,813,180; which in turn is a continuation of U.S. patent application Ser. No. 13/650,179, filed on Oct. 12, 2012, issued on Nov. 26, 2013, as U.S. Pat. No. 8,595,791; which in turn is a continuation of U.S. patent application Ser. No. 12/788,339, filed on May 27, 2010, issued on Nov. 13, 2012 as U.S. Pat. No. 8,312,507; which in turn is a continuation-in-part of U.S. patent application Ser. No. 12/771,491, filed on Apr. 30, 2010, issued on Jul. 12, 2011, as U.S. Pat. No. 7,979,585; which in turn is a continuation of U.S. patent application Ser. No. 11/582,613, filed on Oct. 17, 2006, issued on May 11, 2010, as U.S. Pat. No. 7,716,378. The disclosures of each of the above referenced applications are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field

This invention relates generally to data networking, and more specifically, to a system and method to apply a network traffic policy based on a user identity during an application session.

2. Related Art

The secure data network of a company is a critical component for day-to-day functioning of company business activities. Company employees access the secure data network for communication within the company and with the outside world. Company information, oftentimes proprietary or confidential, is exchanged during the communication.

Typically, an employee gains access to the company's secure data network by means of a network logon procedure using a private user identity, such as a user name "Robert P. Williamson" or an employee number "NG01-60410". Subsequent information exchange using the company's office applications, such as email, file transfer or document control is traceable based on the private user identity through network event logs.

Since the late 1990's, we have been witnessing the phenomenal rising popularity of public communication applications and services, such as email and Instant Messaging offered by Yahoo™, America Online™ (AOL), or Google™, conferencing and collaboration services offered by WebEx™ or Centra™, or peer-to-peer services for a variety of file sharing. Generally, a public communication service allows a user to exchange information through messaging, text chat or document exchange using a public user identity, such as "butterdragon", "fingemail1984", or "peterrabbit".

However, in a company setting, when an employee connects to a public communication service with a public user identity over the company's secure data network, the information exchange is not easily traceable if at all since the public user identity is not tied to the private user identity.

In one example, a company's information technology (IT) department notices that an employee Victor has been using the company's email system to send out proprietary documents, violating the company's security policy. After issuing a warning to Victor, the IT department finds no further violations. Unfortunately, they are not aware of the fact that Victor has continued this activity using Yahoo™ email with a public user identity "PiratesOfCaribbean@Yahoo.com".

In another example, two weeks before a major trade show, a company implements a security measure to monitor communication activities of employees of director level and above to ensure confidentiality of competitive information. This security measure, covering company email, phone conversation and voice messaging, nevertheless proves to be a failure as sensitive information leaks out to a business reporter anyway prior to the trade show. The source of the leak may never be confirmed, but the business reporter privately discloses that he gets the information from an anonymous employee of the company using AOL Instant Messaging™ with screen name "opensecret2006".

The above discussion illustrates the need for a security solution to associate a user identity to a public application.

BRIEF SUMMARY OF THE INVENTION

Method for applying a security policy to an application session, includes: recognizing the application session between a network and an application via a security gateway; determining by the security gateway a user identity of the application session using information about the application session; obtaining by the security gateway the security policy comprising network parameters mapped to the user identity; and applying the security policy to the application session by the security gateway. The user identity may be a network user identity or an application user identity recognized from packets of the application session. The security policy may comprise a network traffic policy mapped and/or a document access policy mapped to the user identity, where the network traffic policy is applied to the application session. The security gateway may further generate a security report concerning the application of the security policy to the application session.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1***a* illustrates a secure network.

FIG. **1***b* illustrates an access session and an application session.

FIG. **1***c* illustrates an access session record and an application session record.

FIG. **2** illustrates a process to generate an application session record.

FIG. **3** illustrates a process to recognize an application session.

FIG. **4***a* illustrates a process to determine a public user identity of application session.

FIG. **4***b* illustrates a data packet in an AIM log-on packet.

FIG. **5** illustrates a process to determine a private user identity.

FIG. **6** illustrates an embodiment of a security gateway obtaining a security policy by querying a corporate directory.

FIG. **7** illustrates a security policy including a security control.

FIG. **8** illustrates a plurality of embodiments of network traffic policy.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1***a* illustrates a secure network.

A secure network **160** includes a host **130**. User **120** uses host **130** to access a public application **180** hosted in application server **190**. Application server **190** is outside of secure network **160**. The network traffic between host **130** and application server **190** passes through security gateway **150**. The security gateway **150** is operationally coupled to a processor **171** and a computer readable medium **172**. The computer readable medium **172** stores computer readable program code for implementing the various embodiments of the present invention as described herein.

Host **130** is a computing device with network access capabilities. The host **130** is operationally coupled to a processor **173** and a computer readable medium **174**. The computer readable medium **174** stores computer readable program code for implementing the various embodiments of the present invention as described herein. In some embodiments, host **130** is a workstation, a desktop personal computer or a laptop personal computer. In some embodiments, host **130** is a Personal Data Assistant (PDA), a smartphone, or a cellular phone.

In some embodiments, secure network **160** is an Internet Protocol (IP) network. In some embodiments, secure network **160** is a corporate data network or a regional corporate data network. In some embodiments, secure network **160** is an Internet service provider network. In some embodiments, secure network **160** is a residential data network. In some embodiments, secure network **160** includes a wired network such as Ethernet. In some embodiments, secure network **160** includes a wireless network such as a WiFi network.

Public application **180** provides a service that allows user **120** to communicate with other users in a real-time fashion. In some embodiments, the service includes text chat. In some embodiments, the service includes a voice call or a video call. In some embodiments, the service includes a network game. In some embodiments, the service includes exchanging a document, such as sending or receiving a text document, a PowerPoint™ presentation, an Excel™ spreadsheet, an image file, a music file or a video clip. In some embodiments, the service includes a collaborative document processing such as creating a document, a business plan, an agreement, wherein user **120** collaborates with other users in a real time fashion. In some embodiments, the service includes a collaborative information exchange such as a conference call. In some embodiments, the service is a social networking service. In some embodiments, the service includes real-time collaboration and non real-time collaboration.

In one example, public application **180** provides America Online Instant Messenger™ service. In one example, public application **180** provides Yahoo Instant Messenger™ voice service. In some embodiments, public application **180** provides a file sharing service such as Kazaa™ file sharing service. In some embodiments, public application **180** provides a network game service such as Microsoft™ Network Game service. In some embodiments, public application **180** provides an on-line collaborative document processing such as Google Docs™, and Salesforce.com™. In some embodiments, public application **180** provides an on-line information exchange and communications such as WebEx™. In some embodiments, public application **180** provides live information streaming such as live video streaming, live audio streaming, and instantaneous picture uploading.

Security gateway **150** is situated at the edge of secure network **160**. Security gateway **150** connects secure network **160** to public application **180**. Security gateway **150** receives network traffic from secure network **160** and transmits the network traffic to application server **190**. Likewise, security gateway **150** receives network traffic from application server **190** and transmits the network traffic to secure network **160**.

In some embodiments, security gateway **150** includes the function of a corporate Wide Area Network (WAN) gateway. In some embodiments, security gateway **150** includes the function of a residential broadband gateway. In some embodiments, security gateway **150** includes the function of a WAN gateway for an Internet service provider.

FIG. **1***b* illustrates an access session and an application session.

User **120** uses host **130** to access secure network **160** during an access session **162**.

Host **130** has a host identity **134**. Host **130** uses host identity **134** to connect to secure network **160**. In some embodiments, host identity **134** includes an IP address. In some embodiments, host identity **134** includes a Media Access Control (MAC) address.

Within secure network **160**, user **120** has a private user identity **124**. In some embodiments, private user identity **124** is an employee number or an employee name. In some embodiments, private user identity **124** is an Internet service subscription identity. In some embodiments, access session **162** is established after a successful network user log-in procedure, such as an employee network log-in, for secure network **160** using private user identity **124**. Private user identity **124** is associated with host identity **134**. In some embodiments, host **130** is a guest computing device. Private user identity **124** is associated with an Ethernet switch port where host **130** connects. In this embodiment, private user identity **124** is a port number, an Ethernet interface identity, or an Ethernet VLAN identity.

User **120** uses host **130** to access public application **180** in an application session **182**. User **120** uses a public user identity **127** during application session **182**. In some embodiments, public application **180** prompts user **120** to log-in before establishing application session **182**. During the application user log-in procedure, user **120** provides to public application **180** public user identity **127**. In another embodiment, public application **180** selects a public user identity **127** for user **120** for application session **182**. In some embodiments, public user identity **127** is set up through a user registration process or a service subscription process. Network traffic in application session **182** passes through security gateway **150**.

FIG. **1***c* illustrates an access session record and an application session record.

Access session record **164** records information about access session **162**. The information includes private user identity **124**, host identity **134** and access session time **166**. In some embodiments, access session time **166** is the starting time when access session **162** is established. In some embodiments, access session time **166** includes the starting time and the ending time when user **120** finishes access session **162**. In some embodiments, access session time **166** is a time stamp for a time during access session **162**.

Application session record **184** records information about application session **182**. The information includes private user identity **124**, public user identity **127**, and application session time **186**. In some embodiments, the information further includes host identity **134**. In some embodiments, application session time **186** includes the starting time when application session **182** is established. In some embodiments, application session time **186** includes a time stamp during application session **182**. In some embodiments, application session time **186** includes a time stamp when security gateway **150** recognizes application session **182**.

FIG. **2** illustrates a process to generate an application session record.

The process of generating application session record **184** includes multiple steps.

In step **201**, security gateway **150** recognizes an application session.

In step **202**, security gateway **150** determines a public user identity of the application session.

In step **203**, security gateway **150** determines a private user identity using information about the application session.

FIGS. **3-5** illustrates steps **201-203** respectively.

FIG. **3** illustrates a process to recognize an application session.

Security gateway **150** inspects network traffic between host **130** and application server **190** to recognize application session **182** for public application **180**.

In some embodiments, security gateway **150** inspects data packet **339** between host **130** and application server **190** for the recognition of application session **182**.

Security gateway **150** includes an application identifier **355** for public application **180**. Application identifier **355** includes information for recognizing application session **182**. In some embodiments, application identifier **355** includes a transport layer information, such as Transmission Control Protocol (TCP) or User Diagram Protocol (UDP); and at least one transport port number, such as a TCP port number or a UDP port number. In some embodiments, application identifier **355** includes application layer information, such as one or more data filters wherein a data filter specifies a value and a position of the value in a data packet. In one example, a data filter is [byte 0 with value "0x52"]. In one example, a data filter is [byte 4-7 with ASCII value of "ADEH"].

Security gateway **150** matches data packet **339** against application identifier **355**.

In some embodiments, application identifier **355** includes transport protocol type of TCP and a destination TCP port number of 5190, the TCP port number used by AIM protocol. In this embodiment, data packet **339** is a TCP packet from host **130** to application server **190**. Security gateway **150** matches data packet **339** against application identifier **355** and determines that public application **180** provides AIM service.

Security gateway **150** creates application session record **184**. Security gateway **150** extracted the source IP address from the IP header of data packet **339**, and stores the source IP address as host identity **134**. In some embodiments, data packet **339** includes link layer information, such as a source MAC address; security gateway **150** extracts and stores the source MAC address as host identity **134**.

In some embodiments, security gateway **150** connects to a clock **359**. Clock **359** indicates the current time of day. Security gateway **150** stores the time of day indicated by clock **359** in application session time **186**.

FIG. **4***a* illustrates a process to determine a public user identity of application session **182**.

The method for determining public user identity **127** is typically specific to public application **180**. In some embodiments, data packet **339** is an application packet. For example, public application **180** provides AIM service; data packet **339** is an AIM packet.

An AIM packet includes multiple fields, for example

Command start field is a 1-byte data field starting at byte offset 0 having a fixed hexadecimal value "0x02";

Channel ID field is a 1-byte data field starting at byte offset 1;

Sequence number field is a 2-byte integer starting at byte offset 2;

Data field length field is a 2-byte data field starting at byte offset 4;

Family field is a 2-byte data field starting at byte offset 6; and

Subtype field is a 2-byte data field starting at byte offset 8.

An AIM log-on packet is a AIM packet with family field having a fixed hexadecimal value of "0x00 0x17" and subtype field having a fixed hexadecimal value of "0x00 0x06".

AIM log-on packet further includes buddy name length field, a 1-byte integer starting at byte offset 19, and a variable length buddy name field starting at byte offset 20. Buddy name length field indicates the length in bytes of buddy name field.

Security gateway **150** matches data packet **339** to determine if data packet **339** is an AIM log-on packet. In some embodiments, data packet **339** is an AIM log-on packet **400** illustrated in FIG. **4***b*. Security gateway **150** extracts buddy name length field **405**. Security gateway **150** furthers extracts buddy name field **407**. In this embodiment, buddy name length field **405** is integer "13" and buddy name field **407** is "JohnSmithI984". Security gateway **150** stores "JohnSmithI984" as public user identity **127** in application session record **184**.

In some embodiments, data packet **339** is not an AIM log-on packet. Security gateway **150** inspects another data packet from host **130**.

FIG. **5** illustrates a process to determine a private user identity.

Secure network **160** includes an identity server **570**. The identity server **570** is operationally coupled to a processor **581** and a computer readable medium **582**. The computer readable medium **582** stores computer readable program code for implementing the various embodiments of the present invention as described herein. Identity server **570** includes access session record **164** of access session **162** during which user **120** accesses application session **182**.

Security gateway **150** queries identity server **570**. Security gateway **150** sends host identity **134** and application session time **186** to identity server **570**.

Identity server **570** receives host identity **134** and application session time **186**. Identity server **570** matches host identity **134** and application session time **186** against access session record **164**. Identity server **570** determines that host identity **134** matches host identity of access session record **164**. Identity server **570** further determines that application session time **186** matches access session time **166** of access session record **164** as application session time **186** is between the starting time and the ending time of access session record **164**. Identity server **570** sends private user identity **124** of access session record **164** to security gateway **150** as a response to the query.

Security gateway **150** receives private user identity **124** from identity server **570**, and stores private user identity **124** in application session record **184**.

In some embodiments, security gateway **150** stores public user identity **127** in application session record **184** after recognizing a log-on approval indication for the public user identity **127** from public application **180**.

In some embodiments, security gateway **150** queries identity server **570** immediately after determining public user identity **127**. In some embodiments, security gateway **150** queries identity server **570** after application session **182** ends.

In some embodiments, security gateway **150** queries identity server **570** by sending a plurality of host identities in a bulk request; and receives a plurality of private user identities in a bulk response.

In some embodiments, application session record **184** includes additional user information associated with private user identity **124**, such as cubicle or office number, cubicle or office location, telephone number, email address, mail-drop location, department name/identity, or manager name.

In some embodiments, security gateway **150** obtains the additional user information from identity server **570**. In some embodiments, security gateway **150** obtains the additional user information by querying a different server, such as a corporate directory server, by using the private user identity **124** received from identity server **570**.

In some embodiments, public application **180** provides file transfer service using File Transfer Protocol (FTP) protocol or a proprietary protocol. In some embodiments, public application **180** provides email service using Simple Mail Transfer Protocol (SMTP), Internet Message Access Protocol (IMAP) or Post Office Protocol version 3 (POP3) protocol.

By using the application session record, the private user identity **124** and the public user identity **127** for an application session **182** may be determined. In some embodiments as illustrated by FIG. **6**, upon determining the public user identity and the private user identity, security gateway **150** obtains security policy **402** for the application session **182** by querying corporate directory **470**. In an embodiment, corporate directory **470** comprises security policy **402**. In some embodiments, corporate directory **470** is a server computer comprising a storage **601** that includes security policy **402**. In some embodiments, corporate directory **470** is a database comprising security policy **402**. In another embodiment, corporate directory **470** is a software module with program code stored on a computer readable medium (not shown) running in a computer. In some embodiments, corporate directory **470** resides in identity server **570**. In some embodiments, corporate directory **470** uses directory technologies such as Microsoft Active Directory™, lightweight directory access protocol (LDAP) directory services, web services, directory services using Java™ technologies. In some embodiments, corporate directory **470** includes a policy server hosting security policy **402** and other policies.

Security gateway **150** queries corporate directory **470** for a security policy, where the query includes user identity **424**. User identity **424** may include private user identity **124** or public user identity **127**. Corporate directory **470** matches user identity **424** against security policy **402** and determines security policy **402** is applicable to user identity **424**. In some embodiments security policy **402** maps network parameters to a user identity and there is a match between user identity **424** and the user identity in the security policy **402**. In some embodiments, security policy **402** maps network parameters to a group identity (not shown) and user identity **424** is a member of the group identity. In response to finding the match between the user identity **424** and the user identity in the security policy **402**, corporate directory **470** sends security policy **402** to security gateway **150**.

In some embodiments, security gateway **150** generates security report **475** based on application session record **184** and security policy **402**. In some embodiments, security gateway **150** generates security report **475** based on a pre-determined user identity or a list of pre-determined user identities. For example, the security report may be generated based on an input of user identity or identities. In some embodiments, security gateway **150** generates security report **475** based on a pre-defined schedule or when requested by an operator.

In some embodiments, security policy **402** includes a security control function as illustrated in FIG. **7**. Security gateway **150** applies the security policy **402** received from corporate directory **470** in response to the query to application session **182**. Security policy **402** typically are configured by a company to protect against improper access to the company confidential documents and to protect against improper usage of the company secure network **160** vital for the company operation. In some embodiments, in response to receiving the security policy **402**, the security gateway **150** confirms that the received security policy **402** contains a user identity that matches the user identity **424** sent in the query. In response to the confirmation, the security gateway **150** applies the security policy **402** to the application session **182**. In FIG. **7**, security policy **402** includes network traffic policy **451** or document access policy **453**.

FIG. **8** illustrates a plurality of embodiments of network traffic policy **451**. In some embodiments, network traffic policy **451** specifies network based application session access control indicating if user identity **424** is denied or allowed to continue application session **182**. If denied, security gateway **150** may stop forwarding data packets **439** of application session **182**. In some embodiments, network traffic policy **451** specifies bandwidth rate capacity such as 1 Mbps, 100 MB per day, or 5 GB per month. In an embodiment, bandwidth rate capacity is measured in packets such as 100 packets per second, 10 thousand packets per day or 4 million packets per month. In some embodiments, network traffic policy **451** specifies a quality of service (QOS) mapped to user identity **424** for application session **182**. For example, network traffic policy **451** indicates a change of Differentiated Services Code Point (DSCP) marking in the data packets **439** of application session **182**. In some embodiments, network traffic policy **451** specifies a queuing delay, a queuing priority, a packet forwarding path, a link interface preference, a server load balancing preference, a packet routing policy, or other control to handle data packets **439** of application session **182**.

In some embodiments, network traffic policy **451** includes a traffic shaping control. In one example, traffic shaping control specifies a TCP profile such as a change of window segment size, or a TCP window adjustment.

In some embodiments, network traffic policy **451** indicates session connection rate control based on user identity **424** specifying a rate or capacity such as 10 session connections per second, 35 concurrent sessions, 100 sessions during lunch hour, 500 sessions a day, 24 voice sessions a day, or 75 file transfer sessions an hour. In some embodiments, network traffic policy **451** may specify, when exceeding the rate or capacity, if application session **182** is denied or data packets **439** of application session **182** are dropped.

In some embodiments, network traffic policy **451** includes application session modification control mapped to user identity **424**, specifying how data packets **439** of application session **182** are modified for the user with the user identity **424**. In one example, application session modification control specifies security gateway **150** should perform network address translation (NAT) to application session **182** for user identity **424**. In one example, security gateway **150** should perform port address translation (PAT) to application session **182** using a pre-determined port number for user identity **424**. In another example, security gateway **150** should perform content substitution if application session **182** is a HTTP session and if a Universal Resource Locator (URL) in data packets **439** of application session **182** matches a pre-determined URL for user identity **424**. In an example, security gateway **150** should perform filename substitution if application session **182** is a file transfer session and if a filename matching a pre-determined filename is found in data packets **439** of application session **182** for user identity **424**. In another example, security gateway **150** should insert a cookie for user identity **424** if application session **182** is an HTTP session, with optionally data packets **439** matching a pre-determined POST or GET request of a URL.

Returning to FIG. **7**, in some embodiments, document access policy **453** specifies if access to document **447** is allowed or denied. In some embodiments, document **447** includes a file, a business agreement, a contract, a spreadsheet, a presentation, a drawing, a textual document, a manual, a program, a piece of software program, a design, a product specification, a datasheet, a video file, an audio file, an email, a voice mail, a fax, a photocopy of a document, or any business document. In some embodiments, document **447** includes an URL leading to digital information such as database query result, a web page, a video, or a piece of music. In some embodiments, document **447** includes real time transfer or streaming of information such as video streaming, audio streaming, a web cast, a podcast, a video show, a teleconference session, or a phone call. In some embodiments, document access policy **453** includes document identity **443** and document user identity **444**. Document identity **443** identifies document **447**. Document user identity **444** identifies the user whose access to the document **447** is affected by the document access policy **453**. In an embodiment, security gateway **150** compares user identity **424** with document user identity **444**. In response to determining that the user identity **424** matches the document user identity **444**, in some embodiments, security gateway **150** allows document **447** with document identity **443** to be accessed by user identity **424**. In another embodiment, security gateway **150** denies access to document **447** with document identity **443**. In denying access, the security gateway **150** may disconnect application session **182** or discard data packets **439**. In some embodiments, security gateway **150** confirms that data packets **439** include document identity **443**. In response to confirming that data packets **439** include document identity **443**, security gateway **150** applies document access policy **453**.

In some embodiments security policy **402** includes time **457** where security policy **402** is applicable within time **457**. In some embodiments, time **457** indicates a beginning time such as 8 am, 4 pm, midnight. In an embodiment, time **457** indicates a time range such as 8 am to 10 am, 7 pm to 5 am, morning hours, lunch, rush hour, prime time. Security gateway **150** compares clock **359** with time **457** and determines if security policy **402** is applicable.

In some embodiments, security gateway **150** generates security message **472** when security gateway **150** determines if security policy **402** is applicable to application session **182** for user identity **424**. In some embodiments, security gateway generates security message **472** when security gateway **150** applies security policy **402** to application session **182**. In some embodiments, security report **475** includes security message **472**. In one example, security message **472** includes security policy **402** and user identity **424**. In one example, security message **472** includes the actions security gateway **150** applies to application session **182** using security policy **402**.

The invention can take the form of an entirely hardware embodiment, an entirely software embodiment or an embodiment containing both hardware and software elements. In a preferred embodiment, the invention is implemented in software, which includes but is not limited to firmware, resident software, microcode, etc.

Furthermore, the invention can take the form of a computer program product accessible from a computer-usable or computer-readable medium providing program code for use by or in connection with a computer or any instruction execution system. For the purposes of this description, a computer-usable or computer readable medium can be any apparatus that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

The medium can be an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system (or apparatus or device) or a propagation medium. Examples of a computer-readable medium include a semiconductor or solid state memory, magnetic tape, a removable computer diskette, a random access memory (RAM), a read-only memory (ROM), a rigid magnetic disk and an optical disk. Current examples of optical disks include compact disk—read only memory (CD-ROM), compact disk—read/write (CD-R/W) and DVD.

A data processing system suitable for storing and/or executing program code will include at least one processor coupled directly or indirectly to memory elements through a system bus. The memory elements can include local memory employed during actual execution of the program code, bulk storage, and cache memories which provide temporary storage of at least some program code in order to reduce the number of times code must be retrieved from bulk storage during execution.

Input/output or I/O devices (including but not limited to keyboards, displays, point devices, etc.) can be coupled to the system either directly or through intervening I/O controllers.

Network adapters may also be coupled to the system to enable the data processing system to become coupled to other data processing systems or remote printers or storage devices through intervening private or public networks. Modems, cable modem and Ethernet cards are just a few of the currently available types of network adapters.

Foregoing described embodiments of the invention are provided as illustrations and descriptions. They are not intended to limit the invention to precise form described. In particular, it is contemplated that functional implementation of invention described herein may be implemented equivalently in hardware, software, firmware, and/or other available functional components or building blocks, and that networks may be wired, wireless, or a combination of wired and wireless. Other variations and embodiments are possible in light of above teachings, and it is thus intended that the scope of invention not be limited by this Detailed Description, but rather by the Claims following.

What is claimed is:

1. A method for applying a security policy to an application session, comprising:

recognizing the application session between a network and an application via a security gateway;

retrieving, by the security gateway, an application session record for the application session, the application session record comprising a first user identity used for accessing the application through a first host, a first host identity for the first host, and an application session time;

recognizing, by the security gateway, an access session between a second host and the network;

retrieving, by the security gateway, an access session record for the access session, the access session record comprising a second user identity used for accessing the network through the second host, a second host identity for the second host, and an access session time;

querying, by the security gateway, an identity server by sending the first host identity and the application session time in the application session record, the identity server comprising the access session record for the access session between the second host and the network;

comparing, by the identity server, the first host identity in the application session record with the second host identity in the access session record, and comparing the access session time with the application session time;

returning, by the identity server, the second user identity in the access session record if the first host identity in the application session record matches the second host identity in the access session record, and if the access session time matches the application session time;

storing, at the identity server, the second user identity as a network user identity used for accessing the network in the application session record;

determining, by the security gateway, at least one security policy applicable to the application session based on a group identity; and

applying the at least one security policy to the application session by the security gateway if the network user identity is a member of the group identity.

2. The method of claim **1**, wherein the determining, by the security gateway, at least one security policy applicable to the application session further comprises determining that the at least one security policy is applicable for the time period.

3. The method of claim **1**, wherein the at least one security policy comprises a network traffic policy.

4. The method of claim **3**, wherein the network traffic policy comprises a bandwidth rate capacity for the network.

5. The method of claim **3**, wherein the network traffic policy comprises a quality of service mapped to the network user identity for the application session.

6. The method of claim **3**, wherein the network traffic policy comprises one or more of: a queuing delay, a queuing priority, a packet forwarding path, a link interface preference, a server load balancing preference, and a packet routing policy.

7. The method of claim **3**, wherein the network traffic policy comprises a traffic shaping control.

8. The method of claim **7**, wherein the traffic shaping control comprises a TCP profile.

9. The method of claim **3**, wherein the network traffic policy comprises an application session modification control based on the network user identity.

10. A computer program product for applying a security policy to an application session, the computer program product comprising:

a non-transitory computer readable storage medium having computer readable program code embodied thereon, the computer readable program code configured to:

recognize the application session between a network and an application via a security gateway;

retrieve, by the security gateway, an application session record for the application session, the application session record comprising a first user identity used for accessing the application through a first host, a first host identity for the first host, and an application session time;

recognize, by the security gateway, an access session between a second host and the network;

retrieve, by the security gateway, an access session record for the access session, the access session record comprising a second user identity used for accessing the network through the second host, a second host identity for the second host, and an access session time;

query, by the security gateway, an identity server, by sending the first host identity and the application session time in the application session record, the identity server comprising the access session record for the access session between the second host and the network;

compare, by the identity server, the first host identity in the application session record with the second host identity in the access session record, and compare the access session time with the application session time;

return, by the identity server, the second user identity in the access session record if the first host identity in the application session record matches the second host identity in the access session record, and if the access session time matches the application session time;

store, at the identity server, the second user identity as a network user identity used for accessing the network in the application session record;

determine, by the security gateway, at least one security policy applicable to the application session based on a group identity; and

apply the at least one security policy to the application session by the security gateway, if the network user identity is a member of the group identity.

11. The computer program product of claim **10**, wherein the computer readable program code configured to determine, by the security gateway, at least one security policy applicable to the application session is further configured to determine that the at least one security policy is applicable for the time period.

12. The computer program product of claim **10**, wherein the at least one security policy comprises a network traffic policy.

13. The computer program product of claim **12**, wherein the network traffic policy comprises a bandwidth rate capacity for the network.

14. The computer program product of claim **12**, wherein the network traffic policy comprises a quality of service mapped to the network user identity for the application session.

15. The computer program product of claim **12**, wherein the network traffic policy comprises one or more of: a queuing delay, a queuing priority, a packet forwarding path, a link interface preference, a server load balancing preference, and a packet routing policy.

16. The computer program product of claim **12**, wherein the network traffic policy comprises a traffic shaping control.

17. The computer program product of claim **16**, wherein the traffic shaping control comprises a TCP profile.

18. The computer program product of claim **12**, wherein the network traffic policy comprises an application session modification control based on the network user identity.

19. A system, comprising:

a corporate directory comprising at least one security policy; and

a security gateway, wherein the security gateway:

recognizes an application session between a network and an application;

retrieves an application session record for the application session, the application session record comprising a first user identity used for accessing the application through a first host, a first host identity for the first host, and an application session time;

recognizes an access session between a second host and the network;

retrieves an access session record for the access session, the access session record comprising a second user identity used for accessing the network through the second host, a second host identity for the second host, and an access session time;

queries an identity server by sending the first host identity and the application session time in the application session record, the identity server comprising the access session record for the access session between the second host and the network, wherein the identity server:

compares the first host identity in the application session record with the second host identity in the access session record, and compares the access session time with the application session time;

returns the second user identity in the access session record if the first host identity in the application session record matches the second host identity in the access session record, and if the access session time matches the application session time; and

stores the second user identity as a network user identity used for accessing the network in the application session record;

determines at least one security policy applicable to the application session based on a group identity; and

applies the at least one security policy to the application session if the network user identity is a member of the group identity.

20. The system of claim **19**, wherein the determines at least one security policy applicable to the application session further comprises determines that the at least one security policy is applicable for the time period.

21. The system of claim **19**, wherein the at least one security policy comprises a network traffic policy.

22. The system of claim **21**, wherein the network traffic policy comprises a bandwidth rate capacity for the network.

23. The system of claim **21**, wherein the network traffic policy comprises a quality of service mapped to the network user identity for the application session.

24. The system of claim **21**, wherein the network traffic policy comprises one or more of: a queuing delay, a queuing priority, a packet forwarding path, a link interface preference, a server load balancing preference, and a packet routing policy.

25. The system of claim **21**, wherein the network traffic policy comprises a traffic shaping control.

26. The system of claim **25**, wherein the traffic shaping control comprises a TCP profile.

27. The system of claim **21**, wherein the network traffic policy comprises an application session modification control based on the network user identity.

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